The strawman language below is an attempt to develop something that responds to the legislation while recognizing the inherent diversity and operational realities of California agriculture. "Swage" language will be in bold italics.	DRAFT – 11/18/2010 (based on original of 11/10/2010) Peter Canessa Center for Irrigation Technology 805 547-1130 / pcanessa@charter.net
Strawman Language	**Reasoning**
Individual farm gate and turnout volumetric deliveries will be measured to +/- ***10% (8%?)*** ***Alternative*** **-** Individual farm gate and turnout volumetric deliveries will be measured to sufficient accuracy to fulfill the requirements of subdivision a) of Section 531.10 and comply with paragraph (2) of 10608.48	One intent is to move all of agriculture (~~to at least partial~~ recognizing the necessity of some constant standby-type charge) to volumetric pricing. Assuming an additional intent is water conservation one assumes that the volumetric pricing is intended to provide some form of price signal to the irrigator in order to move him/her to higher efficiency. The questions are: 1. how much accuracy is needed to implement the intent of the legislation? (this includes accuracy that satisfies the general population that the intent is implemented). 2. how much accuracy can agriculture afford? 3. what *measurement system* provides the accuracy and economics, as well as a sufficient price signal to the individual irrigator? 4. how to prove compliancy? The alternative language is a recognition that no matter what number is chosen for required accuracy in the field, absent a back-up measurement (most likely some form of current metering), there will be no absolute assurance. It is noted that just taking the measuring apparatus out of the field into a lab would also likely not provide assurance as field conditions could be difficult to duplicate in a lab (as well that it would be unfeasible to remove the apparatus in the vast majority of cases). As noted in the 11/9 meeting, this is a lot about "information economics". If I have perfect information I can make perfect choices. However, perfect information can be expensive, not only in strict dollar terms, but in *time* needed to develop it. That is, by the time I acquire my perfect information,

	possibly one or more of my options may have expired. Thus, the constant trade-off for all enterprises is how much information is needed, and how accurate, for the business to make a correct decision. +/- 6%, in the field for any individual measurement does not seem doable. Not saying it can't but I would have to see some very good research that says it is *actually doable* a) on a large scale and long time, b) it is economical, and c) it provides a sufficient economic benefit over +/- 8-10% to justify the costs. Cal Fed apparently published +/- 15%. This seems overly lax to me. But I would point out, as was noted by several of the participants involved with districts, that whenever volumetric pricing is implemented, the member-farmers will "move" the district to the required accuracy. The BurRec Water Measurement manual at page 4-2, "Selecting a device that is not appropriate for the site conditions can result in a nonstandard installation of reduced accuracy, **sometimes greater than +/- 10 percent**." [emphasis mine]
Any measurement or metering device that can be shown to be +/- ***6% (5%?)*** accurate in the laboratory and that is appropriate for the site and correctly installed, maintained, and read in the field, is acceptable. This would include, propeller flow meters, acoustic or doppler radar meters, overflow or undershot weirs, meter gates, or long-crested wiers. Compliance shall be demonstrated by the following: ***1. Within 5 years, all existing measurement devices will***	As previously noted it does not seem the desire of the group to develop an approved list of devices. The BurRec Water Measurement Manual discusses 5 major types of devices in depth that can be used to measure water. Page 4-2 of the manual "Most water measurement devi~~\~~ces can produce accuracies of +/- 5%." Any one of them, if designed, installed, maintained, operated within design limits, and read correctly, should provide +/-10% accuracy. ~~What is a "system of periodic inspection"? Components could include:~~

be inspected for design, installation, and maintenance compliance as per Chapters 5 and 6 of the BurRec Water Measurement Manual. If found out of compliance (e.g., design does not meet BurRec criteria, entrance conditions are too bad for accuracy or will create systemic bias) then either a) the device will be re-engineered and/or re-installed, b) a more suitable device installed, or c) a calibration curve developed.	~~***1. Within 5 years, all existing measurement devices will be inspected for installation and maintenance compliance as per Chapter 5 of the BurRec manual. If found out of compliance (i.e, entrance conditions are too bad for accuracy or will create systemic bias) then either a) device is re-engineered, b) a more suitable device installed, or c) a calibration curve developed.***~~
In addition, proprietary metering devices (e.g., propeller flow meter) will be installed and maintained as per manufacturer's direction.	~~***2. On a rotating basis, all measurement devices will be inspected at least once every five years for installation and maintenance compliance.***~~
2. On a rotating basis, all measurement devices will be inspected at least once every five years for installation and maintenance compliance. Written records sufficient for independent verification will be maintained by the device owner. This will include at a minimum: • ***Date of inspection*** • ***Check list of critical criteria as per Chapters 5 and 6 of the BurRec Manual*** • ***Dated, digital photographs as appropriate*** • ***Actions taken***	~~***3. The system of taking, recording, databasing, and reporting of farm gate and turnout deliveries will be described, noting where care is taken to ensure that the potential accuracy of the device is retained (i.e., "staff gauge measurements are taken to +/- .1 feet and immediately recorded in a handheld computer…").***~~ Further, there is random bias and there is systemic bias. One assertion is that if it assumed that the bias is random, then the aggregated measurements will be much closer to "true" than any one measurement as the random bias tends to cancel errors (i.e., I'm + 10% one time, -10% the next). Thus, the aggregated deliveries at a farm gate will be closer to the true seasonal value and the farmer will be satisfied, as well as the correct price signal given. The aggregated deliveries for the district will be closer to the true seasonal value and thus, the policy objectives of the state will be satisfied as these numbers can be used for planning. There is a whole body of statistics that allow us to take a population sample, with an assumed distribution of error, and estimate the total error. I leave it to the statisticians. However, the important point is that if a measurement point is found to have systemic bias, then there needs to be, at the least, a
3. The system of taking, recording, databasing, and reporting of farm gate and turnout deliveries will be implemented so as to ensure that the potential accuracy of the device is retained (i.e., "staff gauge measurements are taken to +/- .1 feet and immediately	

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recorded in a handheld computer…"). ~~1. A system of periodic inspection of all measurement devices will be implemented that serves to show that the device is installed and maintained correctly. If a head measuring device (i.e., overflow wier) then it shall be installed and maintained as per BurRec Manual guidance. If a proprietary metering device (i.e, propeller flow meter) then it will be installed and maintained as per manufacturer's direction.~~ ~~2. The measurement system is such as to retain the potential accuracy of the device.~~ ~~3. Devices found to be not in physical compliance and uneconomic to replace/re-engineer will have a calibration curve.~~	calibration curve in place. (You might ask if there is systemic error, why not re-engineer or put in a different device? The answer partially lies in information economics but also in the physical conditions at the site, acceptance of the farmer, etc. etc.~~.~~) My feeling is that the July, 2012 date is not practically feasible. Implementing language will not be finalized until sometime in early 2011. Then, planning and engineering has to take place, also arranging for financing. As noted this may entail a 218 election. It is not expected that major construction would take place during an irrigation season, thus it would be late in 2011 before some districts could commence installations. Although I would require a plan to be in place and in progress by July 2012 I would say

Implemetation Schedule – use some sort of language as presented by DWR at 11/9 meeting.	that a better end date would coincide with the 2015 Bulletin 160 update.